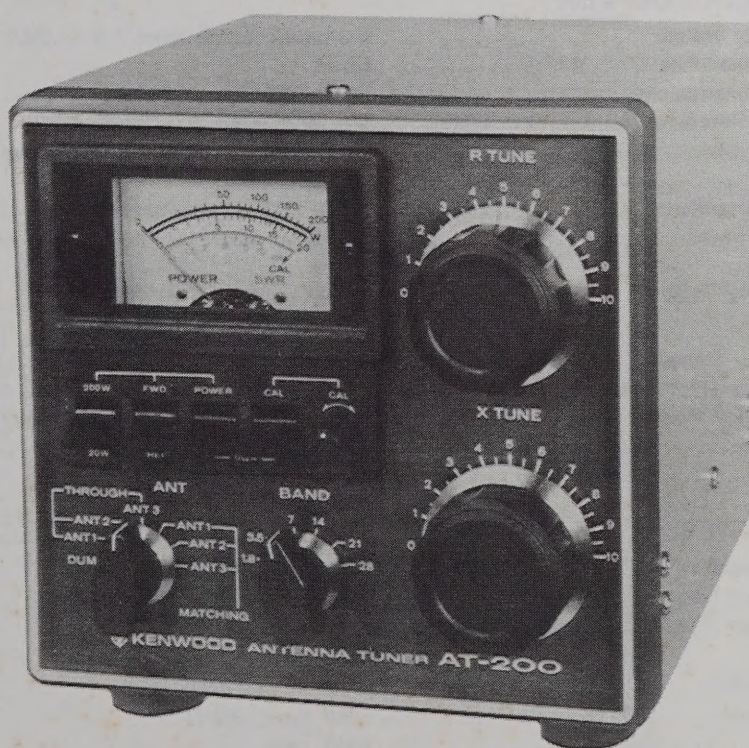




**KENWOOD**

# **SERVICE MANUAL**

**AT-200**



**ANTENNA TUNER**



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### CONTENTS

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### SPECIFICATIONS

#### ANTENNA COUPLER

Frequency Range .....	6 amateur bands from 1.8 to 29.7 MHz.
Input Impedance .....	50 $\Omega$
Output Impedance .....	50 to 500 $\Omega$ , unbalanced
Through Power .....	200 W at max.
Insertion Loss .....	Less than 0.5 dB in well matching state.
PL .....	1.8 MHz only
Output Impedance .....	20 to 500 $\Omega$ , unbalanced
Through Power .....	100 W at max.

#### WATTMETER

Type .....	Through-line wattmeter.
Frequency Range .....	1.8 to 30 MHz.
Measurable RF Power .....	Up to 10/200W, switched.
Kinds of RF Power .....	Forward power and reflected power switched.
Impedance .....	50 $\Omega$
Accuracy .....	Better than $\pm 10\%$ of full scale.

#### SWR METER

SWR Detection .....	Totoidal core direction coupler.
Measurable Range .....	1.1 to 10.
Min. Power Required .....	4 W

#### GENERAL

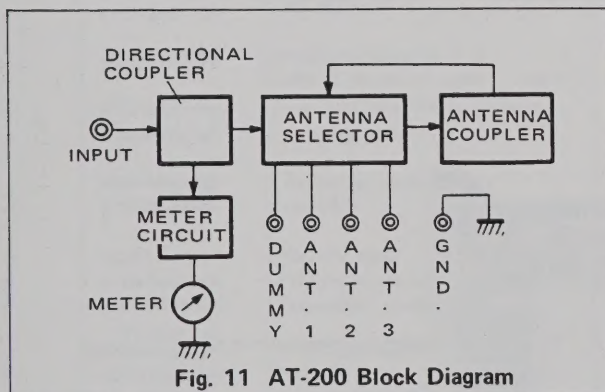
Connectors	INPUT .....	UHF type, 50 $\Omega$
	ANT-1 .....	UHF type
	ANT-2 .....	UHF type
	ANT-3 .....	Wire antenna only.
	GND	
Dimensions	W	166 mm (6-17/32")
	H	153 mm (6")
	D	190 mm (7-1/2")
Net Weight	2.8 kg (6.2 lbs.) approx.	

## FEATURES/BLOCK DIAGRAM/CIRCUIT DESCRIPTION

### FEATURES

1. Your AT-200 is an antenna tuner designed for use with the Kenwood TS-520 and TS-820 series.
2. Your AT-200 consists of an antenna coupler, a through-line RF wattmeter, an SWR meter and an antenna switch.
3. Your AT-200 is designed to be used on the amateur bands between 1.8 MHz and 30 MHz.
4. The RF wattmeter has two ranges, 20W and 200W.
5. The antenna switch has four outputs. Two of these are for coaxial fed antennas; one is for a wire antenna and one is for connecting a dummy load.
6. The antenna matching circuit is effective in reducing TVI as it acts as a band-pass filter.
7. Your AT-200 is also capable of matching your transceiver with a wire antenna such as an inverted-L. Therefore it is possible to enjoy communication on the lower frequency bands.

### BLOCK DIAGRAM



### CIRCUIT DESCRIPTION

#### Directional Coupler

The directional coupler separates and samples the forward and reflected power from the coaxial cable connected from the transceiver to the load. The directional coupler used in your AT-200 provides flat frequency response in all ranges of operating bands by using a toroidal core. Therefore you do not need a calibration table.

#### Meter Circuit

The forward and reflected signal taken out of the directional coupler are used for power and SWR measurements. In the power measurement, the meter can read either forward or reflected power on the respective scales as selected with the 200W–20W switch. In the SWR measurement, on the other hand, the forward power is calibrated with the CAL control so that the meter reads the reflected power as SWR.

#### Antenna Selector

The antenna selector is very useful as it can connect one of the three antennas or dummy load by a single switch, depending on a particular purpose of communication.

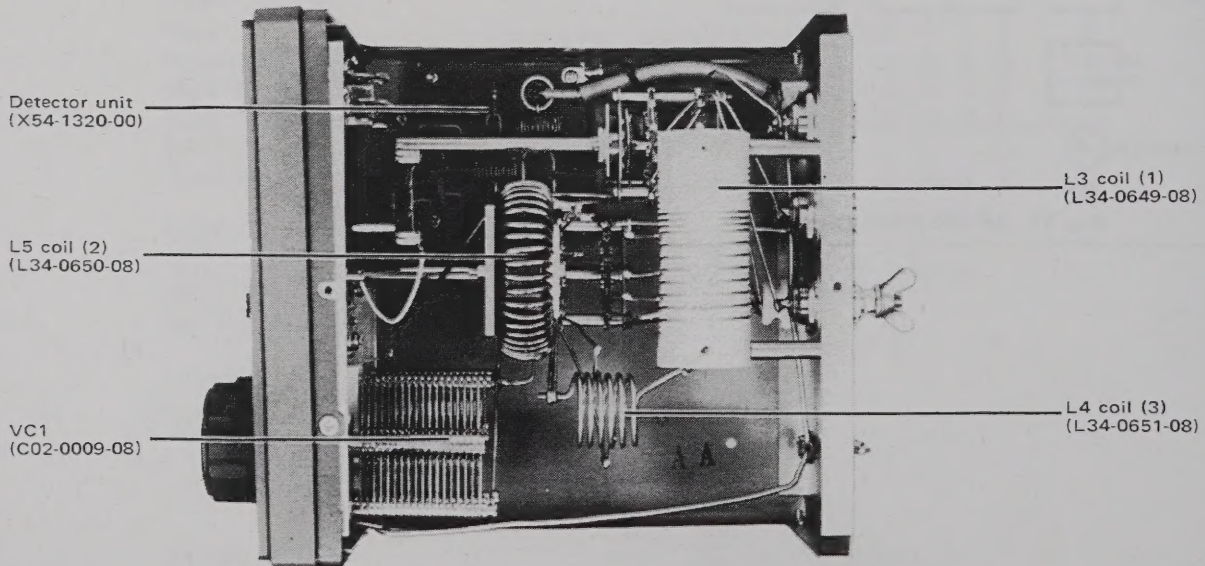
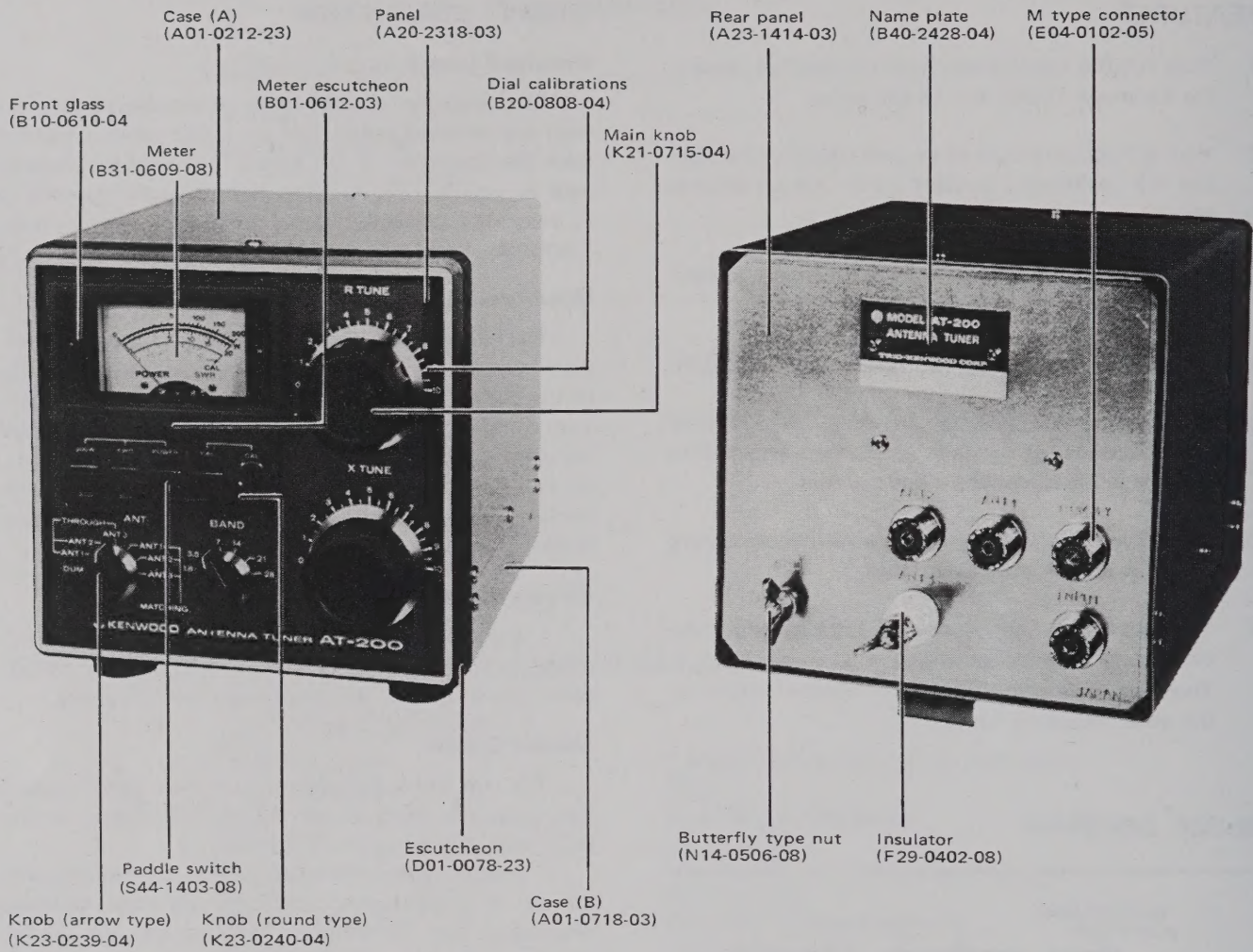
#### Antenna Coupler

The new antenna coupler is a universal matching type that is capable of matching  $10\Omega$  to  $500\Omega$  loads to the  $50\Omega$  input impedance.

The advantages are a low insertion loss realized with the use of a low-loss toroidal core and great harmonic attenuation that is effective in reducing TVI and similar radio interference.



## EXTERNAL VIEW/INTERNAL VIEW





## PARTS LIST

## TOTAL

☆ : New parts

Ref. No.	Parts No.	Description	Re- marks
<b>CAPACITOR</b>			
C5	CK45F1H104Z	Ceramic 0.1μF +80%, -20%	
C6	FM05ZC250J5	Mica 25pF	☆
—	C91-0419-05	Ceramic 82pF 3kV	☆
—	C91-0420-05	Ceramic 12pF 3kV	☆
<b>VC/POTENTIOMETER</b>			
VC1, 2	C02-0009-08	Variable capacitor 300pF 1.2kV	☆
—	R01-3406-08	Variable resistor 20kΩ(B) CAL	☆
<b>COIL</b>			
L3	L34-0649-08	Coil (1)	☆
L4	L34-0651-08	Coil (3)	☆
L5	L34-0650-08	Coil (2)	☆
<b>SWITCH</b>			
—	S01-2408-08	Rotary switch (1) ANT	☆
—	S01-2409-18	Rotary switch (2) BAND	☆
<b>MISCELLANEOUS</b>			
—	A01-0212-23	Case A	☆
—	A01-0718-03	Case B	☆
—	A20-2319-03	Panel	☆
—	B01-0078-23	Escutcheon	☆
—	B01-0612-03	Meter escutcheon	☆
—	B10-0610-04	Front glass	☆
—	B20-0808-04	Dial calibrations X 2	☆
—	B31-0609-08	Meter	☆
—	B40-2428-04	Name plate	☆
—	B46-0058-00	Warranty card	K
—	B50-2570-08	Operating manual	K
—	D23-0061-04	Bearing X 2	☆
—	E04-0102-05	M type connector X 4	☆
—	—	INPUT, DUMMY ANT 1, ANT 2	☆
—	E23-0015-04	Lug type terminal X 2 (earth)	☆
—	E23-0408-05	Terminal X 2	☆
—	F09-0402-05	Insulating cover	☆
—	F29-0402-08	Insulator	☆
—	H01-2562-08	Packing case	☆
—	H12-0438-08	Packing material	☆
—	H20-0372-04	Protection cover	☆
—	J01-0025-04	Foot (assistant)	☆
—	J02-0049-14	Foot X 4	☆
—	J32-0021-04	Round boss X 2 coil (3)	☆
—	J32-0206-04	Round boss X 4 PC board (1)	☆
—	J32-0714-04	Hex. boss X 4 PC board (2)	☆
—	J32-1030-04	Round boss X 2 foot	☆
—	K21-0715-04	Knob X 2 R, X TUNE	☆
—	K23-0239-04	Knob X 2 ANT, BAND	☆
—	K23-0240-04	Knob CAL	☆
—	N10-2030-46	Nut X 4 meter, coil (1), (2)	☆
—	N14-0506-08	Wing nut X 2 ANT 3, GND	☆
—	N15-1030-46	Washer X 8 meter, coil (1) (2)	☆
—	N16-0030-46	Spring washer X 4 meter, coil (2)	☆
—	N30-3004-46	Screw X 4 PC board (1)	☆
—	N30-3006-46	Screw X 19	☆

Ref. No.	Parts No.	Description	Re- marks
—	N30-3008-46	Screw X 2 coil (1)	
—	N30-4006-46	Screw assistant foot	
—	N30-4012-41	Screw X 2 accessories	
—	N32-3006-46	Flat head screw X 8	
—	N35-2010-45	Bind screw X 2 front glass	
—	N35-3006-41	Bind screw X 14 case	
—	N87-3006-46	Tapping screw X 2 name plate	
—	X41-1120-00	Switch unit	☆
—	X54-1320-00	Detector unit	☆

## SWITCH UNIT (X41-1120-00)

Ref. No.	Parts No.	Description	Re- marks
R3	RD148B2E511J	Carbon 510Ω ±5% 1/4W	
VR1	R12-1024-05	Semi-fixed resistor 1kΩ(B)	
VR2	R12-4020-05	Semi-fixed resistor 50kΩ(B) (Substitution)	
VR3	R12-3036-05	Semi-fixed resistor 10kΩ(B)	☆
—	S44-1403-08	Paddle switch X 4	

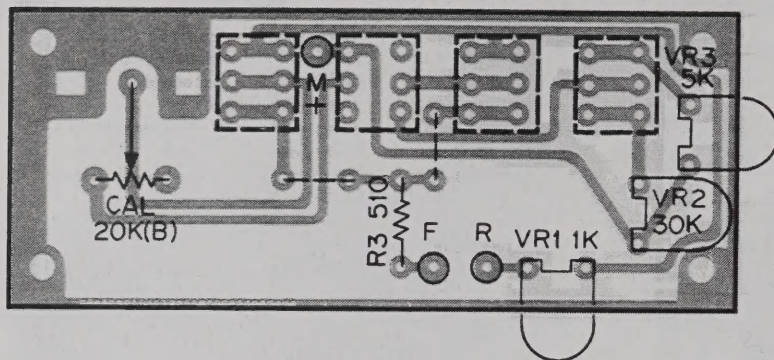
## DETECTOR UNIT (X54-1320-00)

Ref. No.	Parts No.	Description	Re- marks
C1, 2	FM05ZC150J5	Mica 15pF ±5%	☆
C3, 4	CK45F1H104Z	Ceramic 0.1μF +80%, -20%	
R1, 2	RD148B2E510J	Carbon 51Ω ±5% 1/4W	
D1, 2		Diode 2-1K261 When replacing a 2-1K261, substitute two 2-1K261 at the same time for two 1N60.	
L1, 2	L39-0403-08	Detector coil	☆

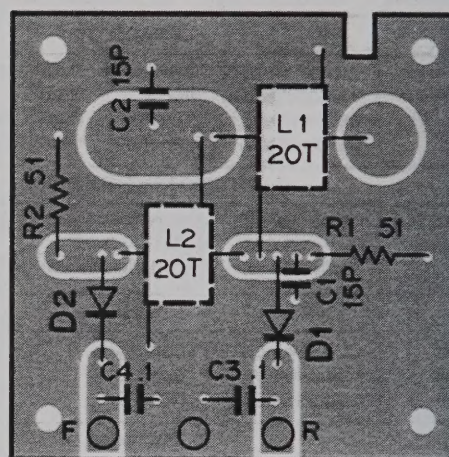


## PC BOARD/DISASSEMBLY

### ▼ SWITCH UNIT (X41-1120-00)



### ▼ DETECTOR UNIT (X54-1320-00)

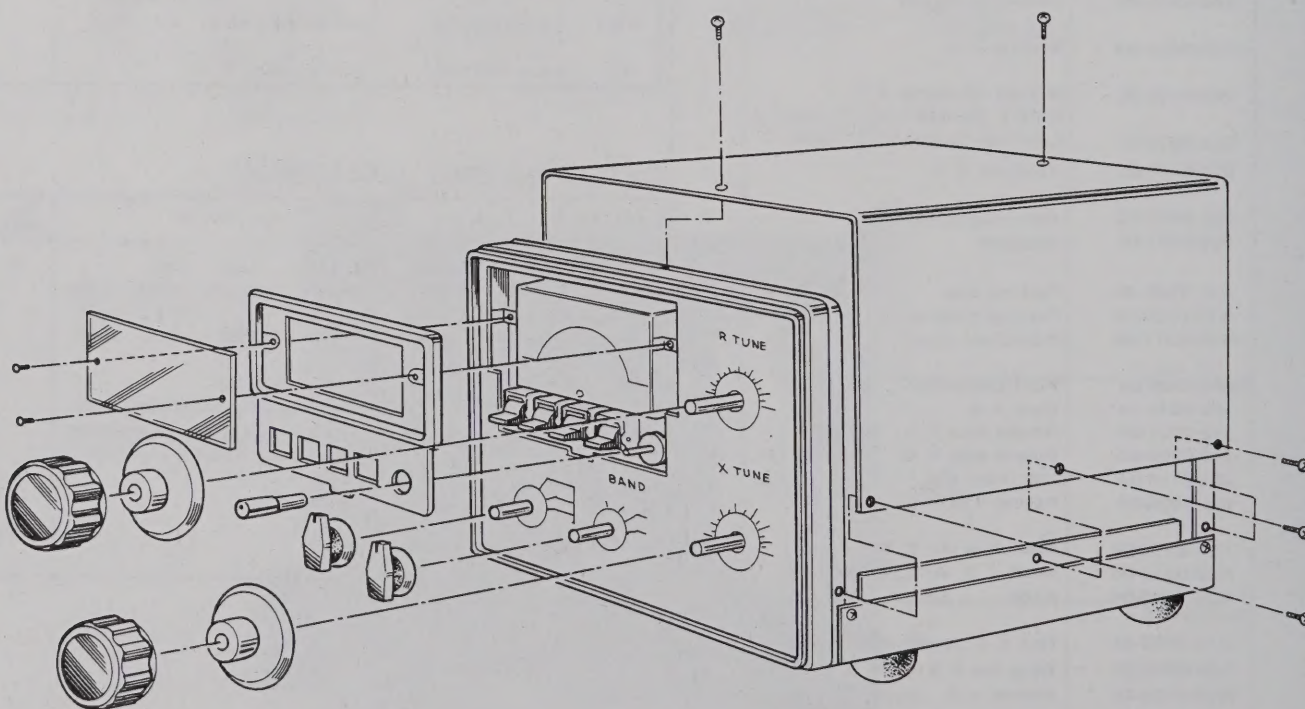


### 1. DISMANTLING THE FRONT PANEL

- ① Dismantle the upper case (8 screws).
- ② Remove the knobs (R, TUNE, X, TUNE, BAND, ANT, CAL).
- ③ Remove screws from the panel (1 at top, 2 at bottom, 2 at side).

### 2. REPLACEMENT OF LEVER SWITCH

- ① Remove screws (2 pcs.) from the meter escutcheon.
- ② Dismantle the upper case (8 screws).
- ③ Use a soldering iron and take out the required switch toward you.





## ADJUSTMENT

### 1. INSTRUMENTS

#### 1) Terminating Power Meter

- ① Measuring frequency range: 50 MHz or more
- ② Input impedance: 50  $\Omega$
- ③ Power range: 20 W and 200 W

#### 2) Transmitter

- ① Output' 100 W CW  
Variable to 10 W in relation to carriers.  
Example: TS-520S, TS-820S

### 2. ADJUSTMENT OF POWER METER

#### 1) Connection

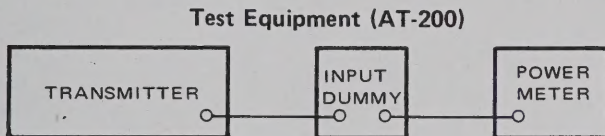


Fig. 1

#### 2) Adjustment

- ① Connect the instruments in accordance with Fig. 1.
- ② Unless otherwise specified, the respective knobs and switches should be set at the following positions:
 

ANT selector SW	DUMMY
BAND selector SW	14
200 W/20 W selector SW	200 W
FWD/RFF selector SW	FWD
POWER/SWR selector SW	POWER
CAL/SWR selector SW	SWR

Adjust the exciter and the AT-200 in the optimum state at 14.175 MHz.

- ③ Adjust the transmitter so that it generates 100 W at the power meter (adjusted to the carrier level). In this state adjust VR2 of the switch unit until the meter of AT-200 points graduation 100.

Switch Unit

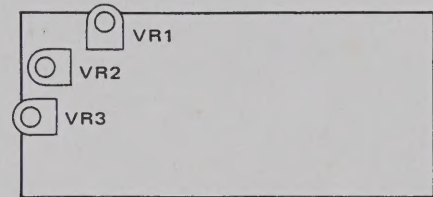


Fig. 2

- ④ In the same manner as for ③, adjust the transmitter output to 10 W and move VR2 until the meter indication attains 10.

### 3. CALIBRATION OF REF POWER

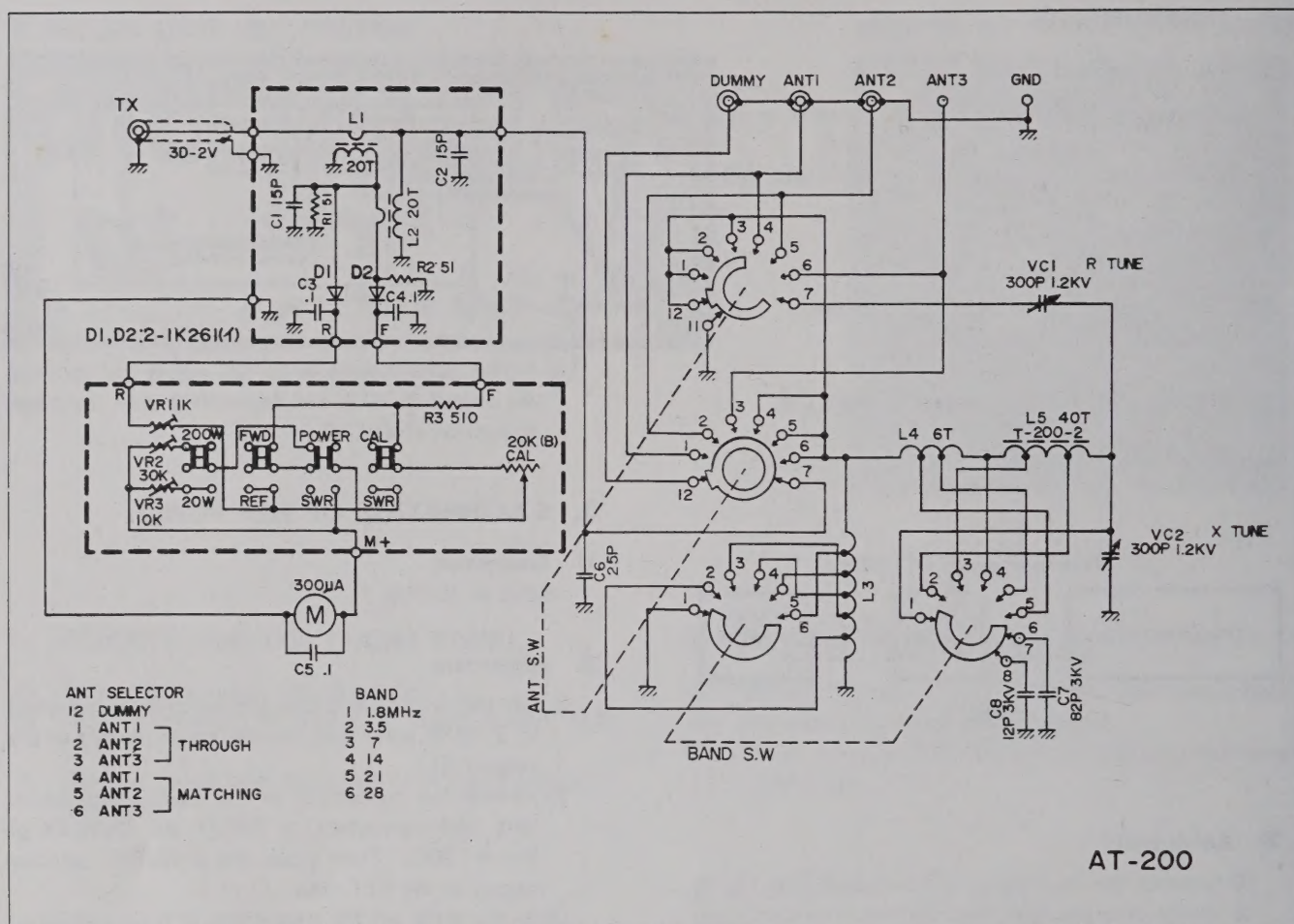
#### 1) Connection

Same as for Fig. 1.

#### 2) Adjustment

- ① Set the respective knobs and switches as described in 2. 2) ②, and memorize the meter reading in the state of ③.
- ② Reverse the connection of the coaxial leads which have been connected to INPUT and DUMMY of the AT-200. Then move the FWD/REF selector switch to the REF side.
- ③ In this state, set the transmitter in the transmitting mode and adjust VR1 until previously confirmed graduation 100 is obtained.

## SCHEMATIC DIAGRAM



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